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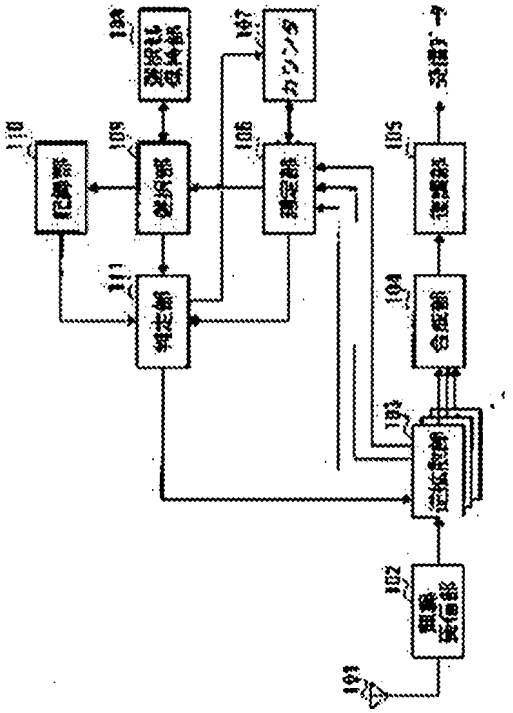
(54) MOBILE COMMUNICATION TERMINAL DEVICE AND HAND-OVER CONTROL METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To save battery of a mobile communication terminal and to prevent an incoming call receiving rate from being deteriorated by reducing useless processing in hand-over control and frequency of occurrence of unnecessary hand-over.

SOLUTION: A recording section 110 records frequency of occurrence of hand-over caused at a prescribed interval according to the result of comparison selection by a selection section 109, a decision section 111 compares the frequency of occurrence of hand-over with a prescribed threshold and a measurement section 106 reduces frequency of measurement of received quality of a perch channel signal after the frequency of the occurrence reaches the prescribed threshold or over. Furthermore, when the measurement frequency is reduced, the decision section 111 controls an inverse spread section 103 so as to receive a plurality of paging channel signals.



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to a mobile communication terminal and the handover control approach.
[0002]
[Description of the Prior Art] The handover which a mobile station awaits, sometimes observes perch channel signaling, and performs selection of the cel which belongs, or the sector which belongs at any time is called an idle handover. After an idle handover, a mobile station receives the call origination of a local station, receives paging channel signaling for detecting the call in of a local station, awaits it, and will be in a condition. Thus, by carrying out an idle handover, a mobile station is awaited and performs selection of a cel or a sector efficiently using the time.
[0003] By the conventional idle handover approach, a mobile station compares the receiving quality of the perch channel signaling transmitted from the base station of a cel to which it belongs with the receiving quality of the perch channel signaling transmitted from the base station of a contiguity cel, and it performs a handover so that the base station of the direction with sufficient receiving quality may be chosen. Moreover, a mobile station is the same approach and performs hand-over between sectors by comparing the receiving quality of the perch channel signaling assigned for every sector.
[0004]
[Problem(s) to be Solved by the Invention] However, there are the following problems in the conventional idle handover approach. Hereafter, the problem of the conventional idle handover approach is explained using drawing 4 and drawing 5 . Drawing 4 is the conceptual diagram of the cel of a radio communications system, and drawing 5 is drawing showing the relation between the fluctuation condition of the receiving level of the perch channel signaling in the conventional idle handover approach, and the selection condition of a cel.
[0005] In drawing 4 , a mobile station 30 is now located near the boundary of the cel 1 in which a base station 10 exists, and the cel 2 in which a base station 20 exists. In this case, a mobile station 30 is ability ready for receiving in both perch channel signaling (henceforth "the perch channel signaling of a cel 1") assigned to the cel 1, and perch channel signaling (henceforth "the perch channel signaling of a cel 2") assigned to the cel 2.
[0006] In such a condition, since both receiving level has rivaled, even if it communicates with which of a base station 10 and a base station 20 in a mobile station 30, since there are very few differences of receiving quality, there is especially no need of performing a handover.
[0007] However, in such a condition, with a mobile station 30, in order for which signal of the perch channel signaling of a cel 1 and the perch channel signaling of a cel 2 is received on higher receiving level to change every moment, the cel which a mobile station 30 chooses will also change with fluctuation of a propagation environment etc. every moment between a cel 1 and a cel 2.
[0008] timing t1- to which the receiving level of the perch channel signaling of a cel 1 and the receiving level of the perch channel signaling of a cel 2 have rivaled, and the perch channel signaling with higher

receiving level specifically performs reception and selection of perch channel signaling since there are few differences as shown in drawing 5 -- it will change every moment for every t4. Therefore, the perch channel signaling chosen in a mobile station 30 and the cel chosen also change every moment in timing t1-t4. For this reason, an unnecessary handover comes to be performed frequently and there is a problem that consumption of the dc-battery of a mobile station 30 will increase.

[0009] Moreover, although a mobile station 30 does not have especially the need of performing a handover, it has the problem that receive two or more perch channel signaling, compare receiving level, and useless actuation of choosing a cel is performed, in the predetermined timing of t1-t4 each time.

[0010] Furthermore, in a mobile station 30, since it is necessary to also change reception of the paging channel signaling which detects the call in from a base station at every selection of a cel, when a handover occurs frequently, there is a problem that possibility that a call in will go wrong will become high, and the rate of arrival of the mail will fall.

[0011] This invention is made in view of this point, and while decreasing the frequency where the useless processing and the unnecessary handover in handover control are performed and planning dc-battery saving, it aims at offering the mobile communication terminal which can prevent that the rate of arrival of the mail falls, and the handover control approach.

[0012]

[Means for Solving the Problem] A measurement means by which the mobile communication terminal of this invention measures the value which shows the receiving quality of two or more control channel signals, A comparison selection means to perform comparison selection actuation which chooses the control channel signal with which the value which compares the value which shows the measured receiving quality and shows receiving quality serves as max, A back-diffusion-of-electrons means to perform back-diffusion-of-electrons processing to an input signal according to a selection result, and a measurement means to measure the frequency which changed the control channel signal in predetermined spacing are provided. A comparison selection means When said frequency becomes more than a predetermined threshold, the configuration which decreases the frequency where said comparison selection actuation is performed is taken.

[0013] Since according to this configuration the frequency where comparison selection actuation is performed is decreased when generating more than frequency predetermined in a handover, the frequency where useless comparison selection actuation and an unnecessary handover are performed can be decreased. Therefore, while being able to plan dc-battery saving, a handover can prevent decline in the rate of arrival of the mail resulting from generating frequently.

[0014] The mobile communication terminal of this invention takes the configuration possessing the control means which controls a back-diffusion-of-electrons means to receive the control channel signal for two or more call-in detection, when the frequency where comparison selection actuation is performed decreases.

[0015] The mobile communication terminal of this invention possesses a record means to record the count of selection for every handover point according to a selection result, and a control means takes the configuration which controls a back-diffusion-of-electrons means to receive two or more control channel signals for call-in detection currently assigned to the handover point with high selection frequency.

[0016] Since according to these configurations two or more control channel signals for call-in detection are received when comparison selection actuation is not performed, when comparison selection actuation is not performed, a call in can be performed certainly.

[0017] The mobile communication terminal of this invention takes the configuration which awaits and sometimes operates.

[0018] Since according to this configuration it awaits and sometimes operates, the frequency where useless comparison selection actuation and an unnecessary handover are performed at the time of an idle handover can be decreased.

[0019] When the frequency of the handover generated in predetermined spacing became more than a predetermined threshold, the frequency where comparison selection actuation which chooses the control channel signal with which the value which shows receiving quality serves as max was performed was

made for the handover control approach of this invention to decrease.
[0020] Since according to this approach the frequency where comparison selection actuation is performed is decreased when generating more than frequency predetermined in a handover, the frequency where useless comparison selection actuation and an unnecessary handover are performed can be decreased. Therefore, while being able to plan dc-battery saving, a handover can prevent decline in the rate of arrival of the mail resulting from generating frequently.
[0021] The handover control approach of this invention received two or more control channel signals for call-in detection, when the frequency where comparison selection actuation is performed was decreased.

[0022] Since according to this approach two or more control channel signals for call-in detection are received when comparison selection actuation is not performed, when comparison selection actuation is not performed, a call in can be performed certainly.
[0023]
[Embodiment of the Invention] The main point of this invention is receiving two or more paging channel signaling while decreasing the frequency where selection actuation (henceforth "comparison selection actuation") of the cel by comparing the receiving quality of control channel signals, such as perch channel signaling, or a sector is performed, when generating more than frequency predetermined in a handover.
[0024] Hereafter, the gestalt of operation of this invention is explained to a detail with reference to a drawing.
(Gestalt of operation) Drawing 1 is the important section block diagram showing the outline configuration of the wireless receiving set carried in the mobile communication terminal concerning the gestalt of 1 operation of this invention. In addition, although the following explanation explains the case where Reception SIR (Signal to Interference Ratio) is used as a value which shows receiving quality, as long as the values which are not restricted to this and show receiving quality are values which can show receiving quality, such as receiving level, they may be what kind of values.
[0025] In drawing 1 , the wireless receive section 102 performs predetermined wireless processing to the signal received through the antenna 101. Two or more preparation is carried out corresponding to each cel, and the back diffusion of electrons of the back-diffusion-of-electrons section 103 is carried out in diffusion code to which the input signal was assigned by each cel. The synthetic section 104 maximum-ratio-compounds the signal for user data division among the input signals by which the back diffusion of electrons was carried out. The recovery section 105 performs predetermined recovery processing to the signal for user data division. Thereby, received data are obtained.
[0026] On the other hand, a test section 106 is predetermined timing and measures Reception SIR per perch channel signaling of the input signals by which the back diffusion of electrons was carried out. Moreover, when generating more than frequency predetermined in a handover, a test section 106 decreases the frequency of measurement timing, and measures Reception SIR. In addition, perch channel signaling is a kind of a control channel signal, and is diffused in diffusion code of the proper assigned for every cel.
[0027] A counter 107 is a counter for counting the count of the measurement timing which is not measured, when it generates more than frequency predetermined in a handover and a test section 106 does not measure the reception SIR of perch channel signaling in the measurement timing after it.
[0028] The selection cel attaching part 108 holds the information which shows the cel which is making current selection. The information which shows a cel is the number of the proper assigned to for example, each cel etc. Only when the reception SIR of perch channel signaling is measured in a test section 106, the selection section 109 chooses the perch channel signaling which shows the greatest reception SIR among the measured reception SIR, and chooses a cel.
[0029] The Records Department 110 accumulates and records the count by which the cel to choose was changed, i.e., the count to which the handover was performed. Moreover, the Records Department 110 accumulates and records the count of selection by the present for every cel.
[0030] The judgment section 111 controls the back-diffusion-of-electrons section 103 to receive the

paging channel signaling transmitted from two or more base stations which have a count of selection in a high order while performing control which decreases the frequency where comparison selection actuation is performed, when the frequency where the cel to choose was changed becomes more than predetermined frequency. In addition, paging channel signaling is a control channel signal for a mobile station to detect the call in to a local station.

[0031] Subsequently, actuation of the mobile communication terminal which has the above-mentioned configuration is explained. Drawing 2 is a flow Fig. for explaining actuation of the mobile communication terminal concerning the gestalt of 1 operation of this invention, and drawing 3 is drawing showing the relation between the fluctuation condition of the reception SIR of perch channel signaling, and the selection condition of a cel in the handover approach concerning the gestalt of 1 operation of this invention.

[0032] A series of actuation shown in the flow Fig. of drawing 2 is actuation performed in the predetermined timing t1-t9 shown in drawing 3 , respectively. In addition, in the following explanation, the perch channel signaling assigned to the cel 1 shall be called "perch channel signaling of a cel 1", and the perch channel signaling assigned to the cel 2 shall be called "perch channel signaling of a cel 2."

[0033] First, refer to the value of a counter 107 for a test section 106 at step (it abbreviates to "ST" hereafter.) 201. And when the counter 107 is "0", in ST202, a test section 106 measures the reception SIR of two or more perch channel signaling, and sends a measurement result to the selection section 109.

[0034] Subsequently, in ST203, the selection section 109 chooses the perch channel signaling used as the greatest reception SIR according to the measurement result in ST202. By this, the cel of the handover point will be chosen. And the selection section 109 sends the information which shows the selected cel to the judgment section 111.

[0035] Subsequently, the selection section 109 makes one count of selection about the cel chosen this time currently recorded on the Records Department 110 increase in ST204. Moreover, the selection section 109 compares the cel chosen with reference to the selection cel attaching part 108 now with the cel chosen this time, and it updates the information held at the selection cel attaching part 108 according to a selection result while making one count of modification of the selection cel currently recorded on the Records Department 110 increase, when different.

[0036] Subsequently, in ST205, with reference to the Records Department 110, the judgment section 111 computes the modification frequency of a selection cel, and compares with a predetermined threshold. Here, the modification frequency of a selection cel is a value which the selection cel was changed how many times in the measurement timing of the predetermined count to current, or shows the rate. That is, the modification frequency of a selection cel serves as a value which shows the handover activation frequency in predetermined spacing. Supposing the handover is performed twice in [4 times by now, for example, current, of] measurement timing, the modification frequency of a selection cel will be computed with "0.5 (50%)."

[0037] When modification frequency has become more than a predetermined threshold as a result of the comparison, in ST206, the judgment section 111 sets a predetermined count as a counter 107. Here, a predetermined count is a count of the measurement timing to which a test section 106 does not measure the reception SIR of perch channel signaling, and the count of the measurement timing which does not measure the reception SIR of perch channel signaling can be adjusted to arbitration by changing this predetermined count suitably. When the predetermined count was set as "1", after modification frequency specifically became more than a predetermined threshold, measurement of Reception SIR will be performed to the measurement timing in every other time. Therefore, if a predetermined count is set as "1", the measurement frequency of the reception SIR after modification frequency became more than a predetermined threshold can be reduced by half.

[0038] Subsequently, in ST207, the back-diffusion-of-electrons section 103 is controlled to receive the paging channel signaling currently assigned to the cel which the judgment section 111 chose according to the information which shows the selected cel sent from the selection section 109. According to this control, the back-diffusion-of-electrons section 103 carries out the back diffusion of electrons of the

paging channel signaling currently assigned to the selected cel, and performs reception.
[0039] On the other hand, in ST201, when the counter 107 is not "0", in ST208, a test section 106 decreases one counter 107. Moreover, a test section 106 does not measure reception SIR of perch channel signaling in this case. And a test section 106 sends the signal which notifies the purport which does not measure reception SIR to the judgment section 111.
[0040] When the purport which does not measure reception SIR is notified, refer to the Records Department 110 for the judgment section 111 in ST209. And the judgment section 111 controls the back-diffusion-of-electrons section 103 to receive the paging channel signaling currently assigned to two or more cels which have a count of selection in a high order. Therefore, by this control, to the timing to which measurement of Reception SIR is not performed, selection frequency will carry out the back diffusion of electrons of two or more paging channel signaling transmitted from a high base station, i.e., a base station appropriate as a selection candidate, in parallel, and the back-diffusion-of-electrons section 103 will perform reception. In addition, that the number of paging channel signaling should just be plurality, it shall not be limited about the number but the range of a high order shall be set up suitably.
[0041] As a result of performing the above-mentioned actuation, the timing to which comparison selection actuation is performed, and the cel chosen come to be shown in drawing 3 . In drawing 3 , the point which the point shown by - mark shows the timing by which the reception SIR of the perch channel signaling of a cel 1 is measured, and was shown by O mark shows the timing by which the reception SIR of the perch channel signaling of a cel 2 is measured. In addition, let a mobile communication terminal for convenience be the thing of explanation which receives two perch channel signaling, the perch channel signaling of a cel 1, and the perch channel signaling of a cel 2, here.
[0042] Now, the counter 107 shall be "0" as an initial state. To the measurement timing t1, since the reception SIR of the perch channel signaling of a cel 1 is higher than the reception SIR of the perch channel signaling of a cel 2, a cel 1 is chosen. Similarly, in t2, a cel 1 and the cel chosen for every measurement timing are changed in [in / on a cel 2 and t3 and / a cel 1 and t4] a cel 2 and t5.
[0043] The predetermined threshold of now, for example, modification, frequency shall be a threshold which shows the modification frequency in 4 times of the measurement timing to current, and shall be set as "1 (100%)." Since the selection cel is changed here each time in 4 times of the measurement timing to t2-t5 in t5, modification frequency is set to "1 (100%)", and becomes more than a predetermined threshold. Therefore, a predetermined count (now referred to as "1" here.) is set as a counter 107. Therefore, measurement of Reception SIR will be performed to the timing in every other time after t5 from which modification frequency became more than a predetermined threshold. Therefore, it becomes the timing of t7 that the reception SIR of perch channel signaling is measured next time. Thus, the frequency where comparison selection actuation is performed after t5 from which modification frequency became more than a predetermined threshold is halved.
[0044] Moreover, to the timing t6 and t8 to which measurement of Reception SIR is not performed, a mobile communication terminal receives in parallel two paging channel signaling transmitted by both base station which exists in a cel 1, and base station who are the base stations where selection frequency is high, and which exists in a cel 2.
[0045] Thus, since according to the mobile communication terminal and the handover control approach concerning the gestalt of this operation the frequency where comparison selection actuation is performed is decreased when generating more than frequency predetermined in a handover, the frequency where useless comparison selection actuation and an unnecessary handover are performed can be decreased. Therefore, while being able to plan dc-battery saving, a handover can prevent decline in the rate of arrival of the mail resulting from generating frequently. Moreover, since two or more paging channel signaling is received when comparison selection actuation is not performed, when comparison selection actuation is not performed, a call in can be performed certainly.
[0046] In addition, since perch channel signaling is assigned according to the individual also to each sector into which a cel is divided, the mobile communication terminal concerning the gestalt of the 1 above-mentioned implementation can perform handover control in the same actuation as the above,

when located near the boundary of a sector.
[0047] Moreover, it is also possible to apply the mobile communication terminal and the handover control approach concerning the gestalt of the 1 above-mentioned implementation to an idle handover. When it applies, the frequency where useless comparison selection actuation and an unnecessary handover are performed at the time of an idle handover can be decreased.
[0048] Moreover, while not measuring the reception SIR of perch channel signaling, you may make it make it sleep in the mobile communication terminal concerning the gestalt of the 1 above-mentioned implementation, without operating a wireless receiving set.
[0049]
[Effect of the Invention] As explained above, while according to this invention decreasing the frequency where the useless processing and the unnecessary handover in handover control are performed and planning dc-battery saving, it can prevent that the rate of arrival of the mail falls.

[Translation done.]